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Proceedings from the regional assessment of Arctic Char (*Salvelinus alpinus*) in the Sylvia Grinnell River, Nunavut, 2009-2011

March 18, 2013
Freshwater Institute, Winnipeg

Chairperson: Margaret Treble

Editors: Kristy Smith and Melanie VanGerwen-Toyne

Fisheries and Oceans Canada
Freshwater Institute
501 University Crescent
Winnipeg, Manitoba, R3T 2N6

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Canada

Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

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SUMMARY

A Regional Advisory Process was held at the Freshwater Institute in Winnipeg March 18, 2013 to assess Arctic Char (*Salvelinus alpinus*) from the Sylvia Grinnell River, Nunavut. The meeting included participants from Fisheries and Oceans Canada Science, and Resource Management, U.S. Fish and Wildlife Service, and the Amaruq Hunters and Trappers Association. During the meeting, presentations were made on the data collected between 2009 and 2011 used to estimate abundance based on a mark-recapture study, to describe the current biological characteristics of the stock, to estimate the total harvest and to evaluate harvest levels by fishing method. Insufficient data were available to estimate the stock abundance, current exploitation rate, harvest level, or to evaluate the impact that snagging Arctic Char has on the stock abundance. This Proceedings report summarizes the relevant discussions.

Compte rendu de l'évaluation régionale de l'omble chevalier (*Salvelinus alpinus*) dans la rivière Sylvia Grinnell, au Nunavut, en 2009-2011

SOMMAIRE

Un processus de consultation régional s'est déroulé à l'Institut des eaux douces, à Winnipeg, le 18 mars 2013, afin d'évaluer l'omble chevalier (Salvelinus alpinus) de la rivière Sylvia Grinnell, au Nunavut. La réunion comprenait des participants provenant des Sciences et de la Gestion des ressources de Pêches et Océans Canada, du Fish and Wildlife Service des États-Unis, et de l'Amaruq Hunters and Trappers Association. Pendant la réunion, on a présenté des exposés sur les données recueillies entre 2009 et 2011 utilisées pour estimer l'abondance en fonction d'une étude de marquage-recapture, afin de décrire les caractéristiques biologiques actuelles du stock, d'estimer la récolte totale et d'évaluer les niveaux de capture par méthode de pêche. On ne disposait pas de données suffisantes pour estimer l'abondance du stock, le taux d'exploitation actuel ou le niveau de capture, ou encore pour évaluer l'impact qu'a l'accrochage d'ombles chevaliers sur l'abondance du stock. Le compte rendu résume les discussions pertinentes qui ont eu lieu.

INTRODUCTION

The meeting started with a review of the terms of reference (Appendix 1), introductions of participants (Appendix 2), and review of the meeting agenda (Appendix 3). The meeting chair provided an overview of how the meeting would proceed. Simultaneous interpretation of the meeting discussions were provided for the Inuktitut participants. Since several people participated in the meeting by telephone, the interpreter also provided consecutive interpretation of the comments made by the Inuktitut participants.

Material from the working paper Information to Support the Assessment of Sylvia Grinnell Arctic Char (*Salvelinus alpinus*) by VanGerwen-Toyne, M., Lewis, C., Tallman, R., and Martin, Z., was presented and formed the basis for the discussions. This working paper would be updated following the meeting based on the discussions and conclusions reached by participants.

PRESENTATION: BACKGROUND AND STOCK ABUNDANCE ESTIMATE

Presenter: Melanie VanGerwen-Toyne

A history of the Sylvia Grinnell Arctic Char fishery was presented. Residents of Iqaluit have been concerned with the number of Arctic Char snagged and discarded at the falls on the Sylvia Grinnell River. Mortalities resulting from snagging are part of the total harvest of Arctic Char from the Sylvia Grinnell River from the subsistence fishery (gillnetting, snagging and angling) and recreational fishery (angling). An initial assessment of snagging mortality was unable to evaluate whether this posed a conservation concern as there was no estimate of abundance for the stock and estimates of total harvest were unavailable (DFO 2008).

The current research program was described. As part of a mark-recapture study, Arctic Char were captured and marked with external T-bar anchor tags in 2009 and 2010 and attempts were made to recapture char from 2009 to 2011 using the same small-mesh gillnets. As very few marked Arctic Char were recaptured, there were insufficient data to accurately estimate stock abundance. However, additional information was collected in tag-return forms completed by local fishers who caught marked Arctic Char and returned them to DFO. These data were used to produce an estimate of abundance. Additional char were marked at the Bay of Two Rivers and these mark and recapture data were added to an additional analysis.

Research had been undertaken in the Frobisher Bay area on Arctic Char genetics and movement patterns (current study and Aaron Spares, 2013, personal communication) to evaluate whether char in the Bay of Two Rivers area were the same stock as those in the Sylvia Grinnell River. The results indicate that the char were likely from different genetic stocks and that there was some mixing of the two stocks in Frobisher Bay.

DISCUSSION

Participants were asked whether there are sufficient data to estimate stock size from DFO nets alone, whether it is valid to pool the recapture data reported by fishers with the DFO recapture data and whether it was appropriate to combine data from Sylvia Grinnell River and Bay of Two Rivers.

Participants all agreed that the data collected using the DFO small-mesh gillnets alone (one marked char recaptured each year) were statistically insufficient to accurately estimate abundance of Arctic Char in the Sylvia Grinnell River.

Participants discussed whether the assumptions of complete mixing and equal probability of capture by marked and un-marked fish were met, given the location of fishing sites and the gear

type used. DFO nets were set only in/near the river, but fishers harvested in the river, the estuary, and in Frobisher Bay. In summer char are widely distributed and therefore, may not have been as susceptible to the DFO nets as to fisher's nets. DFO nets were set to recapture the char at high tides, throughout the summer months, and although it was thought to be sufficient during the survey, it was also likely much less time than the fisher's harvesting effort. Fish marked by DFO were between 300 mm and 450 mm; likely comprising a large proportion of juvenile fish. Juveniles may remain in or near the river while the larger mature char would move further into Frobisher Bay in the summer and possibly remain there longer. This would likely increase the proportion of smaller char in the DFO nets compared to the proportion caught by fishers.

The different gear types used, and their impact on probability of capture were discussed. The gillnets used by DFO were small-mesh so char would get caught by their teeth as opposed to their gills, resulting in less harm to the fish before tagging and release. Local fishers used larger mesh nets targeting larger fish and catching them by the gills. By using small-mesh gillnets a participant questioned whether avoidance of the nets had occurred. Another participant confirmed that they had witnessed some char approaching the net, stopping, and swimming below it. A participant asked whether marked char were likely to be recaptured in DFO's small-mesh nets at all considering their growth in the year(s) between marking and recapture. A bar chart showing the size range of fish marked and recaptured was used in the discussion of whether the marked fish were likely too large to be caught in the small mesh DFO nets in following years. It was concluded that most marked fish were susceptible to capture in the DFO nets in the following years, but that some also reached a size vulnerable to the fisher's larger-mesh nets.

Approximately one in 600 char caught in DFO nets were recaptures, but approximately one in 12 char reported by fishers were recaptures. Participants agreed that unequal probability of capture occurred and therefore, the data did not meet the assumptions of the mark-recapture model. They concluded that the DFO net data should not be pooled with information from the tag-reward forms.

The potential to estimate stock abundance using only the information collected in the tag-reward forms was discussed. One participant noted that since the fishers used larger mesh gillnets they likely caught char that were larger than 450 mm which may never have been susceptible to the DFO gear when fish were initially marked. One suggestion to correct the data was to try to stratify by length group and omit data for fish that would not likely have been susceptible to the small mesh nets when tagging occurred. Unfortunately non-marked char caught by local fishers were not measured; therefore these data were unavailable for this analysis. Further, a participant explained that some fishers caught marked char but did not return them to DFO because they felt the reward for returning tags ($10) was too low. So the total number of marked and unmarked fish captured from the stock by fishers was unknown. It was concluded that it was not possible to estimate stock abundance from the fisher data alone.

Participants discussed combining char from Sylvia Grinnell River with those tagged at Bay of Two Rivers. There are indications from genetic analyses that the char in Sylvia Grinnell River and Bay of Two Rivers are distinct stocks, but that some limited mixing occurs. This lead to consideration of mixing stocks, whether fish would be randomly distributed, and whether the abundance estimate from combining these data would apply to both stocks combined.

Participants discussed potential options for future mark-recapture work that might resolve some of the concerns noted and it was suggested that it was worthwhile documenting the issues encountered with the current study. Another suggested that the monetary reward for returning a marked char should be increased to make it more worthwhile for local fishers to return the tags

to DFO. Different mark-recapture models were also discussed to determine if a more suitable model exists. The Jolly–Seber model was selected because it accommodated immigration and emigration, allowed for the inclusion of all years of data, and had the fewest assumptions. The group agreed, but noted that if a mark-recapture study occurred within a single season, then other analyses could be used. One suggestion was to mark char in the spring as they migrated downstream from the overwintering site(s) and recapture by the local fishers throughout the summer; however, ice breakup in the rivers at the time of the migration precludes the use of gillnets. Another suggestion was to mark char in one area of the river during the late summer/fall upstream migration and recapture later further upstream. It was noted that the design had potential, but there would be financial concerns since two field crews would be required. It was uncertain whether fish would have time to recover from the marking procedure and randomly distribute to ensure the assumption of equal probability of capture was met. Local fishers believe that the char have multiple overwintering sites within the river as well as in Sylvia Grinnell Lake, so the location of the recapture gillnets would need to be close to the marking sites affecting the assumption of equal probability of capture. Using DIDSON sonar to count Arctic Char was suggested as an alternative approach and should be investigated.

Local participants identified the locations where char fishing occurs around Frobisher Bay. They also pointed out several rivers in the area which are used by Arctic Char. This information should be considered in any future assessment or mark-recapture study.

PRESENTATION: BIOLOGICAL CHARACTERISTICS AND CATCH-PER-UNIT-EFFORT

Presenter: Melanie VanGerwen-Toyne

Arctic Char data collected in the DFO nets (fork length, age, sex ratio, total instantaneous mortality, and catch-per-unit-effort (CPUE)) were compared to previous studies from the Sylvia Grinnell River. The current study was designed to mark and recapture char. Gillnets used were small-mesh to minimize mortality. Usually multi-mesh experimental gillnets are used to collect samples for biological characterisation, as was done in previous studies for the Sylvia Grinnell River Arctic Char. The differences in gear type between the current study and previous ones may invalidate comparisons between them. Fork length-frequency distribution for Arctic Char found discarded on the shoreline of Sylvia Grinnell River near the falls area in the current study was compared to previous studies.

DISCUSSION

It was concluded that comparisons of biological characteristics and CPUE between current and previous studies were not valid due to differences in gear type, as well as possible differences in sampling season. The current study collected data throughout the summer but it was not known when previous data collections had occurred. Migration timing is thought to be linked to age and size of fish so larger/older fish may migrate upstream ahead of smaller/younger fish, so it is important to know if previous studies had covered the whole migration or only part of it. For future analyses it may be possible to standardize the data by mesh size and then compare stock status (i.e., compare data collected only in 64 mm mesh across all studies). If these data were available, however, it may result in too few data points in each individual study. Participants recommended this be explored in the near future.

Ageing technique changed in this study which must be considered in comparisons with past results. Otoliths from 1977 through 2004 were aged whole. In this study whole otoliths that read over 10 years were sectioned (which is considered a more accurate ageing technique) and re-

read. Thus older fish reported in the current study may reflect an improved ageing technique rather than an actual increase in age of char.

The biological characteristic data collected from this study provide insight into the current status of the stock. It was discussed that the lack of larger fish represented in the fork length and age frequency distributions was likely an artifact of the small-mesh nets used. The large number of small char was interpreted as reflecting successful recruitment. This suggested the stock was not likely being overharvested. Similarly, local knowledge holders indicated that char were smaller and less abundant after the commercial fisheries, but that in the last decade they have seen larger and more abundant char in the Sylvia Grinnell River.

The fork length-frequency distributions of discarded char collected in the current study and previous studies were discussed. No trend in size of discarded char was observed. Participants thought that smaller char were likely discarded because they were not a significant source of food. However, relatively large char suitable for consumption were also discarded though it was not clear why this was occurring.

PRESENTATION: SUSTAINABLE HARVEST LEVEL

Presenter: Melanie VanGerwen-Toyne

Sustainable harvest level was to be calculated as a proportion of the stock abundance estimate, but since it was concluded that no abundance estimate could be produced, sustainable harvest could not be calculated as intended.

DISCUSSION

One participant commented that the data were quite limited but that additional analyses may be possible using data-poor methods, such as depletion corrected average catch, but that even those would be difficult. The group discussed previous estimates of total removal levels and tried to relate these to current harvest levels. For example, snagging was reported to be approximately 50% or more of total harvest in past studies. Is there a relationship between current levels of snagging and total harvest? Data presented suggest that snagging has decreased since 2008. However, local observations suggested otherwise as large numbers of char carcasses are still seen on the river bottom at the base of the falls. Further, the community of Iqaluit has been growing which has likely resulted in an increase of fishing effort on the Sylvia Grinnell system due to its close proximity to the community, confounding the interpretation of any relationship between snagging and total removals.

While the group felt that there was not sufficient scientific data to quantitatively recommend a sustainable harvest level, they did conclude that the current total removal of Arctic Char in the Sylvia Grinnell River is likely sustainable based on evidence of successful recruitment, as seen in the current fork length and age frequency distribution of the stock.

PRESENTATION: RELATIVE HARVEST BY FISHING METHODS

Presenter: Melanie VanGerwen-Toyne

Data were collected through fisher interviews and tag-reward forms. Methods and results obtained for char harvested by snagging, angling, and gillnetting were described and included information about current captures as well as experience from the whole season. Most char were caught by gillnetting. Char are more susceptible to capture by snagging than from angling. Capture of char by snagging had decreased since 2008 based on information provided in tag-reward forms and fisher interviews.

Discussion

Data on current harvest by various gear/methods were sparse and there may have been some misreporting of harvest methods since snagging was being discouraged. Further, it was noted that some community members had removed discarded fish in the falls area, resulting in fewer char visible on shore; however, many other carcasses were still observed on the river bottom. Therefore, there was insufficient evidence to conclude whether total harvest of char had decreased or not, or what proportion of the total catch was represented by each fishing method. Personal observations confirmed that snagging was ongoing because it is an effective method to capture Arctic Char that congregate below the falls before moving upstream.

A lot of the discussion focused on snagging and how to minimize it. During 2002 through 2006 a ban on snagging char at the falls and gillnetting in the river was in place. This was a voluntary ban which was not enforceable by DFO. In the Nunavut Settlement Area, the Nunavut Wildlife Management Board (NWMB) is the main instrument of wildlife management, but the Minister retains ultimate authority and responsibility for management and conservation of fish. Therefore, DFO can't reduce harvest without indication that the overall harvest is a conservation concern. Non-quota limitations (e.g., restricting gear type, fishing locations and time of fishing) on Inuit's rights to harvest need to follow the decision-making process outlined in the Nunavut Land Claims Agreement and is the responsibility of the NWMB.

The HTA and the community are still concerned with the practice of snagging and discarding fish. DFO must continue to discuss options with the HTA and their co-management partners to encourage responsible fishing practices. More community involvement is needed to support these initiatives. The current public awareness campaign to promote responsible fishing practices should continue. Collaborative monitoring by DFO and the HTA of peak fishing activity near the falls during the upstream migration could provide a stronger, unified message. Peak fishing activity at the falls occurs during low tides, which can occur during the daytime or evening. There was a consensus that in the absence of regulations banning snagging (which may not be possible), a presence at the falls area when char are most susceptible to snagging should occur.

As concluding remarks, participants reiterated that while an estimate of stock abundance was not produced from the current analyses, additional survey approaches and analyses should be investigated. It may be possible, for example, to monitor the stock through an annual age class sample being taken in a systematic repeatable way. This survey would not provide an abundance estimate, but it would provide information to monitor stock status. Furthermore, the Government of Nunavut - Department of Environment is responsible for issuing recreational licences and therefore, they may have information on the number of licences issued in the Iqaluit area on an annual basis. Undertaking a creel census during August may provide an estimate of subsistence harvest.

Participants agreed it was worthwhile to document the methods and results from the current study. It is important to identify what worked and what didn't.

MEETING WRAP-UP

Participants developed summary bullets for the Science Advisory Report to address the terms of reference. Recommendations for future work were identified to improve our understanding of stock status. The Chair concluded the meeting with thanks to all participants.

REFERENCES

DFO. 2008. Assessment of the impact of snagging on the Sylvia Grinnell River Arctic Char population. DFO Can. Sci. Advis. Sec. Sci. Resp. 2008/016.

Gallagher, C.P., and Dick, T.A. 2010. Historical and current population characteristics and subsistence harvest of Arctic Char from the Sylvia Grinnell River, Nunavut, Canada. North American Journal of Fisheries Management 30:126–141.

APPENDIX 1. TERMS OF REFERENCE

Assessment of Arctic Char in the Sylvia Grinnell River, Nunavut, 2009-2011

Regional Peer Review – Central and Arctic Region

March 18, 2013

Winnipeg, MB (teleconference/WebEx)

Chairperson: Margaret Treble

Context

The Sylvia Grinnell River, located in close proximity to Iqaluit, Nunavut, is a traditional fishing site for Inuit. There was a commercial fishery on the river from 1947 to 1951 and again from 1959 to 1966 both of which ended because of declining catch-per-unit-effort. Since the closure of the commercial fishery, harvesting has been limited to recreational and subsistence fisheries. Gallagher and Dick (2010) conducted research to evaluate trends in population characteristics and subsistence harvest of Arctic Char from the Sylvia Grinnell River. They assessed the status of the stock in 2002 and 2004 and compared population characteristics with historic data. They reported that the population had not regained population characteristics typical of the pre-commercial harvest period, and that although there were signs of improvement since 1976–1977 the level of recovery was low.

In 2007 and 2008, there were reports of large numbers of snagged and discarded Arctic Char at the "Falls Area" of the Sylvia Grinnell River. The Amaruq Hunters and Trappers Association (HTA) in Iqaluit asked Fisheries and Oceans Canada (DFO) to report on potential impacts to the Arctic Char population as a result of snagging. In the DFO response to this request, it was noted that data on the population of Arctic Char in the Sylvia Grinnell River were limited and there were insufficient data to conclude that the practice of snagging fish poses a "conservation concern" for the population (DFO 2008). However, snagging is indiscriminate and can catch small, less desirable fish resulting in a high percentage of discards and these small pre-spawning fish are important for the recovery of the population. DFO concluded that although banning snagging would reduce the fishing pressure on pre-spawners, there would be a greater benefit for the population if the area below the falls was closed to all fishing in August.

A mark-recapture study was undertaken, beginning in 2009, to provide a current abundance estimate for the Sylvia Grinnell Arctic Char population. DFO Resource Management has requested an assessment of the status of this stock including an abundance estimate, determination of sustainable harvest levels and whether the current (and recent) removal rate of this fishery (including the snagged and discarded char) would affect the recovery and sustainable harvest of the Sylvia Grinnell River Arctic Char.

Objectives

The objectives of this meeting are to:

1. evaluate the abundance estimate derived from the recent mark-recapture study;
2. evaluate the estimate of total harvest including subsistence (gillnetting and snagging) and recreational (angling) harvests;
3. advise on sustainable harvest levels; and
4. compare the sustainable harvest levels with current harvest from gillnetting, angling, and snagging to determine their impacts on stock abundance.

Expected Publications

- Science Advisory Report
- Proceedings
- Research Document

Participation

- Fisheries and Oceans Canada (DFO) Science and Resource Management programs
- Academics
- Amaruq Hunters and Trappers Association

References

DFO. 2008. Assessment of the impact of snagging on the Sylvia Grinnell River Arctic Char population. DFO Can. Sci. Advis. Sec. Sci. Resp. 2008/016.

Gallagher, C.P., and Dick, T.A. 2010. Historical and current population characteristics and subsistence harvest of Arctic Char from the Sylvia Grinnell River, Nunavut, Canada. N. Am. J. Fish. Manag. 30:126–141.

APPENDIX 2. MEETING PARTICIPANTS

Participants	Affiliation
Lazarus Arreak (Interpreter)	Iqaluit
Randy Brown	U.S. Fish and Wildlife Service, Alaska
Brian Dempson	DFO Science, Newfoundland and Labrador
Colin Gallagher	DFO Science, Winnipeg
Paul Irngaut	Amaruq Hunters and Trappers Association, Iqaluit
Joshua Kango	Amaruq Hunters and Trappers Association, Iqaluit
Chris Lewis	DFO Resource Management, Iqaluit
Kathleen Martin	DFO Science, Winnipeg
Zoya Martin	DFO Science, Iqaluit
Kristy Smith (Rapporteur)	DFO Science, Winnipeg
Ross Tallman	DFO Science, Winnipeg
Margaret Treble (Chair)	DFO Science, Winnipeg
Melanie VanGerwen-Toyne	DFO Science, Winnipeg

APPENDIX 3. MEETING AGENDA

Assessment of Sylvia Grinnell Arctic Char Regional Advisory Process

Date: Monday, March 18, 2013

Location: Fisheries & Oceans Canada, Winnipeg, Science Boardroom (room 3-55)

Chairperson: Margaret Treble

Rapporteur: Kristy Smith

Lead Presenter: Melanie VanGerwen-Toyne

Co-authors: Chris Lewis, Ross Tallman, and Zoya Martin

Time	Agenda Item	Lead
10:00 a.m.	Welcome, Introductions, Review Agenda	Margaret Treble
10:10 a.m.	Presentation: Background and Stock Abundance estimate	Melanie VanGerwen-Toyne
10:20 a.m.	Discussion: Stock abundance estimate	open
11:00 a.m.	Presentation: Biological and CPUE Information	Melanie VanGerwen-Toyne
11:10 a.m.	Discussion: Biological and CPUE Information	open
12:00 p.m.	lunch break	
12:30 p.m.	Presentation: Sustainable Harvest Level	Melanie VanGerwen-Toyne
12:35 p.m.	Discussion: Sustainable Harvest Level	open
1:30 p.m.	Presentation: Relative harvest by fishing methods	Melanie VanGerwen-Toyne
1:40 p.m.	Discussion: Relative harvest by fishing methods	open
2:30 p.m.	Break	
2:40 p.m.	Presentation: Overview of SAR	Melanie VanGerwen-Toyne
2:45 p.m.	Discussion: Final advice/conclusions	open
3:30 p.m.	Meeting Adjourned	Margaret Treble